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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/680,960

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Howard Ge

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21611

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12/11/2006

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 12/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/680,960

Applicant(s)

GE ET AL.

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 09/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-7, and 9-10, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 μ , or greater than 50 μ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0036], discloses that the photosensitive material concentration (in the solution) and the viscosity can be adjusted to obtain the desired thickness of the resist film (claims 1, 5, 9-10). Raguin, in [0033], discloses that the substrate is cleaned (primed) with suitable solvents, acid solutions (contact angle less

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than 90°) etc., prior to the spray coating of the photoresist solution (claims 2, and 6).

Raguin, in [0035], discloses that the photoresist is spray coated in an environment that is saturated with vapor (humidity at least as high as 60%) (claims 3, and 7).

The difference between the claims and Raguin is that Raguin does not disclose that the spray nozzle is moved at varying speeds across the substrate. Raguin does not disclose the photoresist to solvent ratio and the claimed viscosity range.

Kitano, in paragraph no. [0125], and in figure 3, and 17B, discloses that the nozzle is moved across the diameter of the substrate at varying speeds. Kitano, in [0075], [0077], [0079, [0083], discloses that the ratio of the resist to the solvent (with at least 5% solid content) is varied to a range of values so as to keep the viscosity constant. Kitano, in [0138], [0139], and in [0160], and in figure 29, discloses that the viscosity of the resist liquid in the claimed range and that the viscosity is adjusted and determined based on the film uniformity and in accordance with the solid content of the resist material.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the suggestion of Kitano to vary the speed of the nozzle at various regions of the wafer (while scanning across the diameter of the wafer surface) because Kitano, in [0125], discloses that the moving speed or the scanning speed of the nozzle is varied in order to enable the adjustment of the film thickness for each region of the wafer making it possible to obtain a uniform resist film thickness. It would be obvious to a skilled artisan to modify Raguin by employing the method of adjusting the ratio of the resist content (solid) to the thinner (solvent) ratio, and the resultant viscosity as suggested by Kitano

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because Kitano, in [0157], and [0158], discloses that adjusting the solid content in the resist solution influences the resist viscosity which in turn can be adjusted in order to maintain film thickness uniformity.

3. Claims 4, and 8, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) as applied to claims 1-3, 5-7, and 9-10, above and further in view of U. S. Patent Application Publication No. 2004/01853568 (Dammel et al., hereinafter referred to as Dammel).

Raguin in view of Kitano is discussed in paragraph no. 2.

The difference between the claims and Raguin in view of Kitano is that Raguin in view of Kitano does not disclose that the photoresist is a cyclohexanone-based resist (claim 4) and that the photoresist is a propylene glycol monomethyl ether acetate based resist (claim 8) and that the solvent is methyl-ethyl-ketone.

Dammel, in [0034], discloses that the resist can be a propylene glycol monomethyl acetate based resist or a cyclohexanone based resists and that the solvent employed in the composition is ketone based solvent.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of Kitano by employing the resist compositions suggested by Dammel because Raguin, in [0010], discloses using a photoresist material composition to form a layer of thickness greater than 50 μ , and Dammel, in [0028], [0035], and [0036], discloses priming the

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substrate prior to spray coating the substrate with the claimed composition in order to promote adhesion of the thick photoresist layer with the surface of the substrate.

4. Claims 11, 13-18, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 μ , or greater than 50 μ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0033], discloses that the substrate is dried and cleaned (primed) with suitable solutions, solvents, acid solutions (contact angle less than 90°) etc., followed by thorough drying prior to the spray coating of the photoresist solution. (claims 11, 13-15, and 17-18). Raguin, in [0035], discloses that the photoresist is spray coated in an environment that is saturated with vapor (humidity at least as high as 60%) (claim 16).

The difference between the claims and Raguin is that Raguin does not disclose immersing the substrate in a solution, followed by rinsing in ultra pure wafer.

RD91, in the disclosure, teaches immersing (washing in a solution) followed by

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thorough rinsing in wafer prior to priming (cleaning in acid) prior to resist lamination.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the washing and water rinsing processes suggested by RD91 because RD91, discloses that doing so will prevent insufficient adhesion between the substrate and the photoresist layer to be laminated, and Raguin, in [0033], suggests thorough cleaning of the substrate so as to promote adhesion of the photosensitive material.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-18 above, and further in view of U. S. Patent No. 4,791,465 (Sakai et al., hereinafter referred to as Sakai).

Raguin in view of RD91 is discussed in paragraph no. 4.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose immersing the substrate in a peroxide-sulfuric solution for five to fifteen minutes and rinsing in ultra pure water for five to ten minutes (claim 12).

Sakai, in col 4, lines 39-56, discloses that the substrates are immersed in peroxide+sulfuric acid solution followed by a water rinsing process for several minutes.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of RD91 by employing the solution mixtures suggested by Sakai because Raguin, in [0033], discloses that solvents or solutions or acid solutions can be employed for

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cleaning the substrate surface in order to promote adhesion of the surface with the photosensitive material and reduce the probability of defects caused by surface contamination.

Response to Arguments

6. Applicant's arguments, see Remarks, on page 7, lines 14-16, filed 09/22/2006, with respect to claims 1-10, have been fully considered and are persuasive. The 102 rejection of Raguin made over claims 1-3, 5-7, 9-10, in the previous office action (paper no. 20060614) has been withdrawn. Applicant's arguments filed 09/22/2006, with respect to claims 11-18, have been fully considered but they are not persuasive. The 103 rejections made over claims 11-18, are maintained.

A) Applicants argue that Raguin does not disclose that the spray nozzle is not moved across the diameter of the first surface of the substrate.

Raguin, in figures 3(b) and 3(c) discloses the type of wafers that are used to apply photoresist and perform processes to form microstructures, and Raguin, in figure [0053], and in figure 6(e), discloses that the nozzle spray moves across the surface, i.e., moves across the diameter of the substrate.

B) Applicants argue that Raguin does not disclose moving the spray nozzle at varying speeds.

Kitano is depended upon to disclose varying the speed of the nozzle. See paragraph no. 2.

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C) Applicants argue that Raguin does not disclose the claimed photoresist to solvent ratio and the claimed viscosity.

Raguin teaches adjusting concentration by varying photoresist to solvent concentration, and adjusting the viscosity of the resist to a lower value to prevent clogging of nozzle. See paragraph no. 2.

D) Applicants argue that neither Raguin nor RD91 teaches priming the substrate by dipping the substrate in a priming solution that has a water contact angle of between forty and fifty degrees.

Raguin in [0033], teaches cleaning the substrates using organic solvents or acids, which in turn will cause the substrates to have contact angles greater than 40 degrees, followed by drying to remove residual volatiles and /or water. Therefore, Raguin does teach priming the substrate so as to possess the claimed water contact angle. RD91 is depended upon to disclose immersing followed by rinsing the substrate in ultrapure water prior to priming.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

December 3, 2006.

A handwritten signature in black ink, appearing to read "Mark F. Huff", with a stylized flourish extending from the end.

MARK F. HUFF
SUPERVISOR/ PATENT EXAMINER
TECHNOLOGY CENTER 1700